*Final*

# First Semiannual 2010 Groundwater Monitoring Report Defense Fuel Support Point Norwalk, California

Prepared for

**Kinder Morgan Energy Partners, L.P.**

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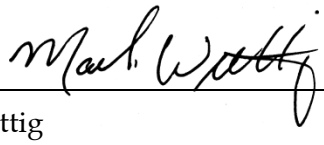
# Signature Page

The material and data presented in this report were prepared consistent with current and generally accepted consulting principles and practices. This work was supervised by the following CH2M HILL licensed professional.



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# Acronyms and Abbreviations

| | |
|---|---|
| µg/L | micrograms per liter |
| 1,2-DCA | 1,2-dichloroethane |
| Alpha | Alpha Analytical, Inc. |
| AMEC | AMEC Geomatrix, Inc. |
| ASTM | American Society for Testing and Materials |
| Blaine Tech | Blaine Tech Services, Inc. |
| BTEX | benzene, toluene, ethylbenzene, and total xylenes |
| Calscience | Calscience Environmental Laboratories, Inc. |
| DESC | Defense Energy Support Center |
| DFSP | Defense Fuel Support Point |
| DIPE | di-isopropyl ether |
| EPA | United States Environmental Protection Agency |
| ETBE | ethyl tertiary butyl ether |
| ft/ft | foot-per-foot |
| Geomatrix | Geomatrix Consultants, Inc. |
| HCl | hydrochloric acid |
| JP-4 | jet propellant 4 |
| JP-5 | jet propellant 5 |
| JP-8 | jet propellant 8 |
| KMEP | Kinder Morgan Energy Partners, L.P. |
| mL/min | milliliters per minute |
| MRP | Monitoring and Reporting Program |
| msl | mean sea level |
| MTBE | methyl tertiary butyl ether |
| NPDES | National Pollutant Discharge Elimination System |
| RAB | Restoration Advisory Board |
| RWQCB | Regional Water Quality Control Board, Los Angeles Region |

| | |
|---|---|
| SFPP | Santa Fe Pacific Pipeline, L.P. |
| SVE | soil vapor extraction |
| TAME | tertiary amyl methyl ether |
| TBA | tertiary butyl alcohol |
| The site | Defense Fuel Support Point, Norwalk, California |
| TPH | total petroleum hydrocarbons |
| TPH-d | total petroleum hydrocarbons quantified as diesel fuel |
| TPH-fp | total petroleum hydrocarbons quantified as fuel product |
| TPH-g | total petroleum hydrocarbons quantified as gasoline |
| TPH-$jp_5$ | total petroleum hydrocarbons as jet propellant 5 |
| VOA | volatile organic analysis |
| VOC | volatile organic compound |

# 1. Introduction

CH2M HILL has prepared this groundwater monitoring report on behalf of Santa Fe Pacific Pipeline, L.P. (SFPP), an operating partnership of Kinder Morgan Energy Partners, L.P. (KMEP), and the Defense Energy Support Center (DESC) to summarize the results of groundwater monitoring activities conducted at the Defense Fuel Support Point (DFSP), Norwalk, California (the site) during the first half of 2010 (not including the June 2010 monthly monitoring). The site location and vicinity are shown in Figure 1. As described in the *Groundwater Sampling and Analysis Plan, DFSP Norwalk/SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California* (Geomatrix Consultants, Inc. [Geomatrix], 1995) (the sampling plan), SFPP and the DESC jointly conduct groundwater sampling and analysis events at the site.

Groundwater monitoring is conducted in accordance with the revised Monitoring and Reporting Program (MRP) for the site, approved by the California Regional Water Quality Control Board, Los Angeles Region (RWQCB) in May 2002, and additional requests received thereafter from the RWQCB. This report is based on information from sampling work performed by Parsons and Blaine Tech Services, Inc. (Blaine Tech). Blaine Tech was retained to perform groundwater monitoring by SFPP and DESC since the first sentry event in January/February 2010 and the first semiannual event in April/May 2010. CH2M HILL was retained by SFPP to compile and interpret the data from these sources and prepare this summary report.

Site assessments indicated that the principal chemical constituents of concern at the DFSP are total petroleum hydrocarbons (TPH), including TPH quantified as gasoline, diesel fuel, jet propellant 4 (JP-4), jet propellant 5 (JP-5), and jet propellant 8 (JP-8); benzene, toluene, ethylbenzene, and total xylenes (BTEX); 1,2-dichloroethane (1,2-DCA); and methyl tertiary butyl ether (MTBE). In addition, tertiary butyl alcohol (TBA) has been detected in samples collected in recent investigations and, along with other fuel oxygenates, has been added to the MRP pursuant to a request made by the RWQCB in March 2009. Additional background information regarding investigations and monitoring events at the DFSP is presented in previously submitted semiannual groundwater monitoring reports listed in Section 6.

Specific monitoring wells and remediation wells are monitored on a semiannual or annual basis in accordance with the revised MRP in effect for the site to evaluate groundwater elevation and groundwater quality conditions. Table 1 summarizes information for groundwater monitoring and remediation wells associated with the site.

In addition to the semiannual monitoring events, certain wells are monitored during calendar quarters when the semiannual monitoring event is not performed. Initially, wells monitored during these quarterly monitoring events consisted of 11 "sentry wells" selected by the site's Restoration Advisory Board (RAB) in 1998. These sentry wells are located at and around the site near the edge(s) of one or more plumes associated with the site, and/or have exhibited variable chemical concentrations over time. These wells are monitored to provide data on seasonal variations in concentrations of chemicals in groundwater and to

provide "early warning" of significant changes in the plumes. Thus, the quarterly monitoring events are referred to as the "sentry monitoring events" or "sentry events."

Since 1998, wells have been added to or removed from the sentry event in accordance with requests made by the RWQCB. In addition, certain wells are voluntarily monitored by DESC or SFPP based on requests made by the RAB. These wells and the basis for their inclusion in this sentry event are listed in Table 2.

In addition to sentry and semiannual monitoring events, certain wells are monitored on a monthly basis by SFPP, pursuant to a request from the RWQCB in February 2010. The RWQCB requested SFPP increase the monitoring frequency from quarterly to monthly for wells GMW-36, GMW-O-15, GMW-O-16, GMW-O-18, GMW-O-19, and PZ-5 in the southeastern offsite area. These wells, and the basis for their inclusion in this sentry event, are also listed in Table 2. SFPP began the monthly monitoring in March 2010. Independent data tables for March and May 2010 are not presented in this report since these monthly events coincided with SFPP's sentry and semiannual monitoring events, respectively. June 2010 data are not presented in this report due to time constraints; however, these data will be submitted to the RWQCB as soon as the data become available. The April 2010 monthly event is discussed in Section 2. Monthly monitoring results are also presented to the RWQCB and RAB in the transmittals.

This First Semiannual Groundwater Monitoring Report includes groundwater monitoring data collected during the following events:

- Sentry event in January and March 2010
- Monthly event in April 2010
- Semiannual event in April and May 2010.

# 2. Field and Laboratory Activities

An overview of the sentry and semiannual monitoring events is provided in Section 2.1. Field and laboratory methods are described in Section 2.2.

## 2.1 Overview of Monitoring Events

This section summarizes the gauging and sampling activities conducted for the first quarter 2010 sentry event, April 2010 monthly event, and first semiannual 2010 monitoring event.

### 2.1.1 First Quarter Sentry Event

The first quarter sentry event was conducted by Blaine Tech on behalf of DESC and SFPP. DESC wells were sampled on January 11, 12, and 13, 2010; SFPP wells were sampled on March 15 and 16, 2010. All but one well (GMW-O-15) were purged and sampled using low-flow methods in general conformance with American Society for Testing and Materials (ASTM) International D6771-02 (Puls and Barcelona, 1996). The pump in well GMW-O-15 was operating during sampling activities; therefore, groundwater samples were collected from the pump discharge at this location. Overall, Blaine Tech gauged 52 wells and sampled 39 of those wells during the first quarter 2010 sentry event. Wells WCW-3, WCW-7, and WCW-13 were gauged during both DESC and SFPP monitoring events. Wells EXP-1, EXP-2, and EXP-3 were gauged and sampled during both DESC and SFPP monitoring events. Well MW-SF-4, located in the intermediate block valve area, contained free product and therefore was not sampled. Table 2 lists the wells monitored during the first quarter 2010 sentry event. Well gauging and sampling records for this event are provided in Appendix A.

### 2.1.2 Monthly Event

The April 2010 monthly event was conducted by Blaine Tech on behalf of SFPP. Samples were collected from the following wells on April 16, 2010: GMW-36, GMW-O-15, GMW-O-16, GMW-O-18, GMW-O-19, and PZ-5 in the southeastern offsite area. All wells were purged and sampled using low-flow methods prior to sample collection. Free product was not detected in any of the wells that were monitored. Table 3 lists the wells monitored during the April 2010 monthly event. Well gauging and sampling records for this event are provided in Appendix B.

### 2.1.3 Semiannual Event

The first semiannual event was conducted by Blaine Tech on behalf of DESC and SFPP. The DESC wells were sampled April 12 through April 19, 2010; the SFPP wells were sampled May 24 through May 28, 2010. Blaine Tech gauged 50 DESC wells and sampled 49 DESC wells; GW-15 was not sampled due to the presence of free product. In addition, Parsons gauged 86 wells on April 7 and 8, 2010, as part of DESC's voluntary monitoring for the site. Blaine Tech gauged 85 SFPP wells and sampled 62 SFPP wells; two wells (GMW-36 and MW-15) contained free product and therefore were not sampled. Blaine Tech also gauged the same 85 SFPP wells on May 28, 2010, to provide additional data for SFPP's capture zone study. Overall, a total of 135 wells were gauged and 111 of those wells were

sampled during the semiannual sampling event. Sampling was conducted using low-flow methods, as described in Section 2.2. Table 4 lists the wells monitored during April and May 2010. Well gauging and sampling records for the semiannual sampling event are provided in Appendix C.

The total fluids extraction and soil vapor extraction (SVE) systems for the south-central and southeastern portions of the site were shut down prior to the April and May 2010 gauging events. The north-central groundwater extraction system was turned off prior to the April 2010 event but was operational during SFPP's May 2010 sampling event. The West Side Barrier groundwater extraction system was shut down in August 2008 and has remained off since then. The SVE and biosparging systems in the north-central area have not been operating since February 2008.

# 2.2 Field and Laboratory Methods

Field activities during the first quarter sentry event, April 2010 monthly event, and first semiannual event were conducted in accordance with the sampling plan and as described below in Section 2.2.1. Groundwater samples collected for DESC were submitted to Calscience Environmental Laboratories, Inc. (Calscience). Groundwater samples collected for SFPP were submitted to Alpha Analytical, Inc. (Alpha). Both analytical laboratories are certified by the Environmental Laboratory Accreditation Program of the California Department of Public Health. Samples were submitted to these laboratories for the analyses described in Section 2.2.2.

## 2.2.1 Field Methods

Prior to purging and sampling, depth to water in each well was measured using an electronic water level sounder. For wells historically containing free product, an interface probe was used to measure depth to water and depth to product, if any. The field instruments used to gauge the wells were cleaned with a laboratory-grade, nondetergent cleaner, then rinsed successively in two containers with distilled water before each use. With the exception of well GMW-O-15 during the sentry event, all wells were purged and sampled using low-flow methods. Prior to sampling, each well was purged by using low-flow purge techniques at a rate of approximately 200 milliliters per minute (mL/min). During purging, groundwater field parameters consisting of temperature, pH, electrical conductivity, turbidity, dissolved oxygen, and oxidation reduction potential were monitored. Water levels also were monitored during low-flow purging to verify minimal drawdown. Samples for SFPP were collected using a 2-inch submersible Grundfos® pump with new or dedicated tubing, whereas samples for DESC were collected using a 2-inch bladder pump. Well gauging and sampling records are provided in Appendixes A, B, and C.

Groundwater field parameters were allowed to stabilize prior to collecting the sample. Water samples to be analyzed for TPH quantified as gasoline (TPH-g), TPH quantified as fuel product (TPH-fp), and volatile organic compounds (VOCs) were collected in 40-milliliter volatile organic analysis (VOA) vials containing hydrochloric acid (HCl) preservative, filled to zero headspace, and sealed with Teflon® septa and airtight caps. Samples to be analyzed for TPH as JP-5 (TPH-$jp_5$) were collected in unpreserved ½-liter amber sample jars and sealed with Teflon®-lined airtight caps. The samples were labeled and placed on ice for transport to the laboratory following proper chain-of-custody procedures.

### 2.2.2 Laboratory Analytical Methods

The laboratory analysis program for the sampling events included (1) analyses for TPH using United States Environmental Protection Agency (EPA) Method 8015 (modified) following both purge and trap and extraction sample preparation techniques, and (2) VOCs using EPA Method 8260B. Results for TPH analyses using the purge and trap preparation technique were quantified and reported against a commercial gasoline standard and are abbreviated as "TPH-g" throughout this report. Results for TPH analyses using extraction sample preparation for groundwater samples collected by Blaine Tech on behalf of SFPP were quantified and reported against a standard of site fuel collected from the north-central remediation system and provided to the laboratories by a former DESC contractor. These results are abbreviated as "TPH-fp" throughout this report. Results for TPH analyses using extraction sample preparation techniques for groundwater samples collected by Blaine Tech on behalf of DESC were quantified and reported against JP-5 and are abbreviated as "TPH-$jp_5$" throughout this report. The carbon ranges for TPH-g, TPH-fp, and TPH-$jp_5$ are approximately C4-C13, C8-C22, and C6-C20, respectively.

As described in the Second Semiannual 2008 Groundwater Monitoring Report (Parsons, 2009), DESC collected a free product sample near the truck fill station (due to the absence of collectable free product in the north-central remediation system area) to replace their fuel product standard that expired in June 2008. DESC compared the chromatographic patterns exhibited by the new product standard and the former fuel product standard to determine whether or not the new fuel product standard was a suitable replacement. Chromatographic patterns of new fuel product and the former fuel product standard did not match; therefore, additional analyses were performed using diesel fuel product and JP-5 standards. Based on the result of chromatographic correlation, DESC selected the JP-5 standard as the replacement standard for future extractable TPH analysis since the October 2008 monitoring event.

# 3. Groundwater Gauging Results

This section describes measurement of water level and free product thickness during the sentry, monthly, and semiannual monitoring events.

## 3.1 First Quarter Sentry Event

A total of 52 wells were gauged on behalf of DESC and SFPP during the sentry event. Free product was observed in only one of these wells: well MW-SF-4 in the intermediate block valve area. This well has historically contained free product. Water level measurements and groundwater elevations for wells gauged during the sentry event are summarized in Table 2.

## 3.2 Monthly Event

Six wells (GMW-36, GMW-O-15, GMW-O-16, GMW-O-18, GMW-O-19, and PZ-5) in the southeastern offsite area were gauged during the April 2010 monthly event. Free product was not observed in any wells. Water level measurements and groundwater elevations for wells gauged during the monthly event are summarized in Table 3. Monthly sampling of these wells in May 2010 is captured in the semiannual event.

## 3.3 Semiannual Event

A total of 135 wells were gauged during the semiannual sampling event. Gauging data collected by Blaine Tech on April 12 and May 28, 2010, were used in contouring groundwater elevations. These maps also incorporated free product thickness data from the Parsons gauging event on April 8, 2010.

### 3.3.1 Groundwater Flow Conditions

Groundwater elevation contours for the uppermost groundwater zone are shown in Figure 2. Water level measurements and groundwater elevations for the April/May 2010 semiannual event are presented in Table 4. Historical water level measurements and groundwater elevations are presented in Table 5. In total, groundwater elevation data from 111 wells in the uppermost aquifer were used in interpreting site groundwater elevation contours, flow directions, and hydraulic gradient for the uppermost groundwater zone.

Groundwater elevation data from 18 wells measured by Blaine Tech on April 12 and May 28, 2010, were not considered in contouring groundwater elevation in the uppermost groundwater zone. These wells included:

- Three wells gauged by Blaine Tech with measurable free product in April and May 2010
- Five wells screened in the Exposition aquifer
- Seven wells screened near the bottom of the uppermost aquifer (denoted as “MID” wells)

- Six wells with groundwater elevations that were inconsistent with surrounding groundwater elevations in April/May 2010 and were considered anomalous.

Groundwater levels encountered during April/May 2010 were generally similar to those encountered during previous monitoring events at the site. However, a more northwesterly component was interpreted along the central portion of the site. This apparent shift in groundwater flow direction may be an artifact of the noncontemporaneous gauging data used for contouring. The horizontal hydraulic gradient in the uppermost aquifer ranged from 0.001 foot-per-foot (ft/ft) toward the northwest across the site and the eastern offsite area to 0.002 ft/ft toward the north-northeast across the western offsite area. Local variations in hydraulic gradient are apparent and may reflect the influence of geologic heterogeneity, differences in well completion intervals, or effects of remediation system operations. Groundwater elevations used in contouring ranged from 44.09 to 52.98 feet above mean sea level (msl). In general, groundwater elevations were approximately 0.4 foot higher than those reported in October 2009 (Parsons, 2010a) and approximately 0.4 foot lower than those reported in April 2009 (AMEC Geomatrix, Inc. [AMEC], 2009).

Groundwater levels in the seven wells (GMW-O-4 [MID], MW-18 [MID], MW-19 [MID], MW-20 [MID], MW-21 [MID], MW-22 [MID], and MW-23 [MID]) screened in the lower section of the uppermost aquifer varied from groundwater levels measured in nearby wells installed in the upper portion of the uppermost aquifer. In general, groundwater levels measured in these "MID" wells are lower than groundwater levels measured in nearby wells (with the exception of similar groundwater levels measured in well pair MW-21 [MID] and HL-3). Groundwater elevations in these seven "MID" wells ranged from 40.29 to 47.76 feet above msl.

Groundwater levels were measured in the five Exposition aquifer wells (EXP-1 through EXP-5) at and near the site. Groundwater elevations used in contouring the Exposition aquifer ranged from 22.87 to 24.71 feet msl. Figure 3 shows groundwater elevation contours for the Exposition aquifer. Groundwater elevations in the Exposition aquifer were approximately 1.6 feet lower than those in April 2009 (AMEC, 2009). The groundwater gradient in the Exposition aquifer beneath the site in April/May 2010 was 0.001 ft/ft toward the southeast, indicating a flow direction generally similar to those previously interpreted for the site. The groundwater flow direction in the Exposition aquifer remains substantially different than the uppermost groundwater zone.

### 3.3.2 Distribution of Free Product

During this semiannual monitoring event, free product was observed in 3 of the 135 wells that were gauged (GMW-36, MW-15, and GW-15). Free product also was detected in three wells (GMW-53, TF-17, and TF-18) during the Parsons supplemental gauging event on April 7 and 8, 2010. Free product was detected at thicknesses ranging from 0.01 to 2.05 feet. Free product thicknesses, well gauging data, and groundwater elevations are summarized in Table 4. The detection of free product in these wells during this sampling event along with data obtained from remediation system operations and historical detections of free product were used in interpreting the current extent of free product at the site. These interpretations are shown in Figure 2 and indicate free product in the northern tank farm area (the north-central free product plume), the truck rack area, the south-central area, and the southeastern 24-inch block valve area.

The north-central free product plume is interpreted as two separate smaller plumes. Free product thicknesses shown in Figure 2 include free product data from three wells (TF-17, TF-18, and GMW-53) measured by Parsons on April 8, 2010, but not gauged by Blaine Tech. The plume associated with wells TF-17 (0.02-foot thickness) and TF-18 (0.03-foot thickness) is interpreted to be similar to previous events. The interpreted plume associated with GMW-53 (0.01-foot thickness) is isolated and has not been reported in previous sampling events. In the eastern area, a small free product plume is also interpreted based on a measurable thickness of free product in well GW-15 (2.05-foot thickness); free product has been detected in this well since April 2008.

Free product was again observed north of the truck rack in well MW-15, and remained undetected in wells GMW-4 and MW-9 in May 2010. Northwest of the truck rack area, free product was not detected in GMW-10, where it has been detected in the past.

Free product was detected in the southeastern 24-inch block valve area in well GMW-36 (0.06-foot thickness) during this monitoring event. Free product was not detected in adjacent well GMW-O-15 where it has been detected in the past.

No free product was detected in the south-central area during the April/May 2010 semiannual monitoring event; however, free product plumes are interpreted to be present (Figure 2) based on historical detections of free product in this area.

# 4. Groundwater Quality

Groundwater quality results for the sentry, monthly, and semiannual monitoring events are presented below in Sections 4.1, 4.2, and 4.3, respectively.

## 4.1 Results for Sentry Event

Groundwater quality results for the sentry event were transmitted to the RWQCB in March 2010 (Parsons, 2010b) and April 2010 (AMEC, 2010a). In general, chemical concentrations reported for groundwater samples collected during this sentry event were similar to concentrations reported during the previous semiannual sampling event conducted in October 2009. Pursuant to the RWQCB's request, groundwater samples collected during this sentry event were also analyzed for TBA and other fuel oxygenates using EPA Method 8260B. Laboratory analytical results for TPH-g, TPH-fp (or TPH-$jp_5$), BTEX, MTBE, 1,2-DCA, and TBA are summarized in Table 6. Other VOCs detected by the EPA Method 8260B analyses are summarized in Table 7. Copies of laboratory reports and chain-of-custody records for the first quarter 2010 sentry event are provided in Appendix D.

No VOCs, including MTBE and TBA, were detected in any of the Exposition aquifer wells sampled during the sentry event.

## 4.2 Results for Monthly Event

Groundwater quality results for the April 2010 monthly sampling event were submitted to the RWQCB in June 2010 (AMEC, 2010b). VOCs, TPH-g, and TPH-fp were not detected in wells GMW-O-16 and GMW-O-19 during this event. Reported concentrations of VOCs, TPH-g, and TPH-fp in wells GMW-36 and PZ-5 were generally similar to or lower than those reported in March 2010, with the following exceptions: (1) TBA was reported at a higher concentration in both wells, and (2) TPH-fp was reported at a higher concentration in well PZ-5. Reported concentrations of VOCs, TPH-g, and TPH-fp in wells GMW-O-15 and GMW-O-18 were generally higher than those reported in March 2010. Laboratory analytical results for the April 2010 monthly event are summarized in Table 8. Copies of laboratory reports and chain-of-custody records for the April 2010 monthly event are provided in Appendix E.

## 4.3 Results for Semiannual Event

The April/May 2010 semiannual analytical results for TPH, benzene, 1,2-DCA, MTBE, and TBA were used to develop isoconcentration contours and interpret the extent of these analytes in groundwater beneath the site. Isoconcentration contours for TPH, benzene, 1,2-DCA, MTBE, and TBA are presented in Figures 4 through 8. Analytical results from the current semiannual monitoring event (April/May 2010) and three previous monitoring events (July 2009 sentry event, October 2009 semiannual event, January/March 2010 sentry event) are also included in these figures. Laboratory analytical results for TPH, BTEX, 1,2-DCA, MTBE, and TBA are summarized in Table 9, and other VOCs detected by EPA

Method 8260B analyses are summarized in Table 10. Historical analytical results are presented in Table 11. Copies of the laboratory reports for the April/May 2010 semiannual monitoring event are presented in Appendix F. Results are summarized for selected analyte or analyte groups in the following subsections.

### 4.3.1 Total Petroleum Hydrocarbons

The analytical results for TPH-g/TPH-fp or TPH-g/TPH-$jp_5$ reported for each well during the semiannual monitoring event are summed and contoured as TPH in Figure 4. This representation of TPH concentration is conservative because the hydrocarbon range reported by the TPH-g analysis overlaps the ranges reported by both the TPH-fp and TPH-$jp_5$ analyses, and most samples with detected TPH contained hydrocarbons within the ranges of the overlap. The separate concentrations of TPH-g, TPH-fp, and TPH-$jp_5$ are listed in Table 9.

Samples collected from DESC wells in the north-central free product plume area were not analyzed for TPH-g, with the following exceptions: (1) wells GMW-17, GMW-18, GMW-59, GMW-60, GMW-61, and GMW-62 were analyzed for both TPH-g and TPH-$jp_5$; and (2) samples collected from SFPP wells were analyzed for both TPH-g and TPH-fp. The maximum reported concentration of TPH-g was 26,000 micrograms per liter (µg/L) observed in well GMW-O-14 in the southern offsite area. The maximum reported concentration of extractable TPH (TPH-fp or TPH-$jp_5$) was 11,000 µg/L of TPH-fp observed in well MW-9 near the truck rack area. TPH was not detected in samples collected from the Exposition aquifer wells during the semiannual monitoring event.

In the north-central part of the site, reported TPH concentrations are similar to those reported in recent monitoring events. The TPH concentration in wells GMW-16, GMW-18, and GMW-19 during this event increased since October 2009; the TPH concentration in wells GMW-16 and GMW-19 were nondetect in October 2009. A decrease in TPH concentration was reported in wells GMW-12, GMW-15, and GMW-32; the TPH concentration in well GMW-31 decreased below the detection limit. Overall, the lateral extent of TPH in the north-central area remains similar to that interpreted in October 2009.

In the eastern part of the site, TPH isoconcentrations are generally similar to those interpreted in October 2009. Results from the investigation performed by Parsons in Holifield Park in 2007 were considered in the interpretation of the eastern extent of the TPH plume in the east portion of the site. TPH has not been detected in wells GMW-63 and GMW-64 in the eastern offsite area since monitoring of these wells began in October 2008. Similarly, TPH has not been detected in offsite well GMW-65 since monitoring of this well began in October 2009. The reported TPH concentration in wells GMW-47, GMW-58, GMW-59, and GMW-60 during this event decreased since October 2009. Reported TPH concentrations in wells GMW-61 and GMW-62 have increased slightly, but remained within the historical ranges for these two wells. TPH-fp has not been analyzed for these wells since October 2008.

The lateral extent of the interpreted TPH plume in the northwest portion of the site has reduced since October 2009 based on a nondetect concentration in a sample collected from well WCW-8 during this semiannual event. In the southwest area of the site, reported TPH concentrations were similar to those reported in October 2009. The overall extent of the interpreted dissolved TPH plume in the area has slightly reduced based on decreased

TPH concentrations (to nondetect) in well GMW-O-2 located upgradient of the south-central plume.

In the south-central free product plume area, reported TPH concentrations were similar to those reported in recent monitoring events. The TPH concentration reported in well GMW-27 was a historical low for this well. The extent of the northern portion of this plume has been slightly reduced based on nondetect concentrations reported in wells GMW-8 and MW-12. In the vicinity of the intermediate 24-inch block valve area, TPH concentrations decreased in wells MW-SF-1 and PZ-10, and slightly increased in wells GMW-1 and MW-SF-9 as compared to the October 2009 monitoring event. A sample was collected from well MW-SF-4 during this event since free product was not reported in this well.

In the southern offsite area, TPH was detected in well GMW-O-14, but at a concentration approximately 50 percent less than the concentration reported in October 2009. An increase in TPH was reported in GMW-O-10 during this event; however, this remains within the range of past detections in this well. TPH decreased to nondetect in offsite well GMW-O-2. TPH remained nondetect in all other monitoring wells south of the site during this semiannual event.

Near the truck rack area, the eastern extent of the interpreted TPH plume remained consistent with the October 2009 interpreted extent. The TPH concentration in well GMW-14 increased during this event; the TPH concentration remained nondetect in well GMW-3. Samples were collected from wells GMW-4 and GMW-9 during this event since free product was not reported in these wells. Well MW-15 was not sampled because free product was observed in the well during this semiannual event.

In the southeastern part of the site, the lateral extent of the TPH plume is similar to the interpreted plume for October 2009. TPH was detected in well PZ-5, but at a slightly higher concentration than the value reported in October 2009. A decrease in TPH was reported in wells GMW-O-15, GMW-O-16, and GMW-O-18 during this event compared to recent sampling events. Well GMW-36 was not sampled due to the presence of free product in the well. TPH was not detected in other wells in the southeastern area.

### 4.3.2 Benzene

Dissolved benzene concentrations reported during the semiannual monitoring event are contoured in Figure 5. Analytical results for benzene in groundwater samples collected during this semiannual event indicated concentrations ranged from nondetect in many wells to a concentration of 7,900 µg/L in well GMW-O-14 in the southern offsite area. Benzene also was detected in offsite well GMW-O-10. The benzene detection in GMW-O-10 (77 µg/L) was approximately 10 times higher than the detection reported in October 2009 (6.9 µg/L); however, it remains within the historical range of detections in this well. Benzene was not detected in offsite wells west of the site or in any of the Exposition aquifer wells with one exception: the groundwater sample collected by Blaine Tech on behalf of DESC from well EXP-3 contained trace levels of benzene (0.31J µg/L). The "J" qualifier indicates that the analyte was positively detected, but the concentration is estimated because the value was below the analytical reporting limit. Benzene was not, however, detected in the split sample from EXP-3 collected by Blaine Tech on behalf of SFPP.

The interpreted dissolved benzene plumes across the site were similar in lateral extent to the interpretations based on data collected in October 2009. In the eastern part of the site, benzene concentrations decreased in wells GMW-59, GMW-60, and GMW-62, while increasing in wells GMW-58 and GMW-61 since October 2009.

The benzene plume in the north-central area remains similar to the plume interpreted in October 2009. The lateral extent of the western portion of the plume was slightly extended due to a low-level detection in well PZ-3. The northern extent of the benzene plume was decreased slightly based on a nondetect reported in well GMW-6. Increases in benzene concentrations were reported in wells GMW-17, GMW-18, GMW-19, GMW-45, TF-16, and TF-21 during this semiannual event.

Overall, the benzene plume in the south-central area appears to be similar in extent to the plume interpreted in October 2009. In the intermediate 24-inch block valve area, a significant decrease in benzene concentrations was reported in well MW-SF-1, while an increase was reported at well GMW-1 since October 2009. Benzene was reported in only two southern offsite wells (GMW-O-10 and GMW-O-14) during this semiannual event. The benzene detection reported at well GMW-O-14 was approximately 50 percent lower than the value reported in October 2009.

Near the truck rack area, benzene was detected in wells MW-9, GMW-4, and GMW-14. Benzene was nondetect at well GMW-14 in October 2009. Samples were not collected at wells MW-9 and GMW-4 during October 2009 since free product was present.

In the southeastern 24-inch block valve area, benzene was detected in well PZ-5 at the same concentration as the October 2009 event (1,100 μg/L). Benzene also was detected at GMW-O-15 at a slightly higher concentration than the April 2010 sentry event. Benzene decreased to nondetect in well GMW-O-18. Well GMW-36 was not sampled during the semiannual event since free product was present. Overall, the lateral extent of the benzene plume in the southeastern area remains similar to that observed during the previous semiannual event.

### 4.3.3 1,2-Dichloroethane

Dissolved 1,2-DCA concentrations reported during the semiannual monitoring event are contoured in Figure 6. Analytical results for 1,2-DCA indicated concentrations ranged from nondetect in many wells to a concentration of 110 μg/L in well GMW-O-14 in the southern offsite area. With the exception of the 1,2-DCA concentration in GMW-O-14, detected concentrations of 1,2-DCA were below the conservative risk-based cleanup goal for 1,2-DCA (70 μg/L). 1,2-DCA was not detected in any of the Exposition aquifer wells, nor was it detected in any of the wells in the north-central, eastern, and southeastern portions of the site.

In the western plume region, 1,2-DCA concentrations decreased in wells WCW-3, WCW-7, GW-13, MW-7, and MW-14. 1,2-DCA in well MW-6 (1.5 μg/L) is consistent with the concentration reported in October 2009. A slight increase in 1,2-DCA was reported in wells PW-3 and MW-25. The lateral extent of the plume in the region remained relatively consistent with the interpreted extent for October 2009.

As listed in Table 9 and shown in Figure 6, 1,2-DCA concentrations in groundwater in the vicinity of the West Side Barrier and in the western offsite area have remained consistently

below the risk-based cleanup goal for 1,2-DCA since 2005. Pumping of the West Side Barrier wells was discontinued in August 2008; groundwater quality conditions in the area have been stable since then and will continue to be monitored.

### 4.3.4 Methyl Tertiary Butyl Ether

Dissolved MTBE concentrations reported during the semiannual monitoring event are contoured in Figure 7. Analytical results for MTBE indicated concentrations ranged from nondetect in many wells to 440 µg/L in well MW-SF-4 in the intermediate 24-inch block valve area. With the exception of MTBE in well MW-SF-1 in the south-central area, MW-SF-4 in the intermediate block valve area, and PZ-5 and GMW-O-15 in the southeastern area, detected concentrations of MTBE were below the conservative risk-based cleanup goal for MTBE (40 µg/L). MTBE was not detected in any of the Exposition aquifer wells, with one exception: the groundwater sample collected by Blaine Tech on behalf of DESC from well EXP-1 contained trace levels of MTBE (0.44J µg/L), but at a concentration below the laboratory reporting limit. MTBE was not detected, however, in the split sample from EXP-1 collected by Blaine Tech on behalf of SFPP.

The distribution of dissolved MTBE was similar to that interpreted for the previous semiannual monitoring event. During April/May 2010, MTBE was detected in the following areas: beneath the western portion of the site, in well WCW-7 in the adjacent western offsite area, in the southeastern area near the 24-inch block valve, in the north-central and eastern areas of the site, in the south-central area and southern offsite area, and in well GMW-14 north of the truck rack area.

The interpreted lateral extent of MTBE in the western area of the site is similar to the interpretation for October 2009. However, the northwestern plume extent has decreased due to nondetect values reported at wells WCW-4 and WCW-8 during the April/May 2010 monitoring event. In addition, the eastern lobe of the plume decreased in extent because of nondetects reported in wells MW-27 and GMW-40. Low-level detections of MTBE in wells GMW-41, GW-6, and MW-11 are interpreted as two smaller plumes in Figure 7. As shown in Figure 7, MTBE in well MW-11 is interpreted as a separate plume.

The lateral extent of MTBE in the southeastern 24-inch block valve area is similar to the interpretations for October 2009. However, the southern extent of the MTBE plume was increased slightly based on a low-level detection in well GMW-O-16 during this event. Well GMW-36 was not sampled due to the presence of free product in this well. MTBE concentrations have decreased in wells GMW-O-15, GMW-O-18, and PZ-5 during this event. MTBE concentrations have continued to decrease in well PZ-5, and have decreased to nondetect in well GMW-39.

MTBE concentrations decreased in wells PZ-10 and MW-SF-9 (nondetect) in the intermediate 24-inch block valve area. MTBE concentrations also decreased in wells GMW-27 and MW-SF-1 in the south-central portion of the site. A slight increase in MTBE concentrations was reported in offsite well GMW-O-10 (0.87 µg/L) during this event compared to October 2009 (0.77 µg/L). No MTBE detections were reported in well HL-2 in the southwestern portion of the site during October 2009 or April/May 2010.

Concentrations of MTBE remained nondetect in all but one offsite monitoring well: WCW-7 west of the site. MTBE detected in well WCW-7 (1.2 µg/L) was below the risk-

based cleanup goal for MTBE (40 μg/L). Pumping of the West Side Barrier wells was discontinued in August 2008; groundwater quality conditions in the area will continue to be monitored.

### 4.3.5 Tertiary Butyl Alcohol

Dissolved TBA concentrations reported during the semiannual monitoring event are contoured in Figure 8. The lateral extent of TBA is generally limited to the eastern, northwestern, north-central, and southeastern 24-inch block valve areas. Analytical results for TBA indicated concentrations ranged from nondetect in many wells to 69,000 μg/L in well PZ-5 in the southeastern offsite area. Also in the southeastern area, TBA was detected in wells GMW-O-15 and GMW-O-18 at concentrations higher than those reported in recent monitoring events. TBA concentrations were nondetect in wells MW-8, GMW-38, and GMW-39, which represents an overall decrease in TBA since the October 2009 event in the southeastern area.

In the eastern area, TBA was detected at low levels in wells GMW-47, GMW-58, GMW-59, and GMW-61. TBA was detected in several wells in the north-central area, but also at relatively low concentrations. The maximum TBA concentration was reported in north-central well GMW-35 (2,200 μg/L). Isolated detections south, southwest, and west of the north-central area were reported in wells GMW-12, GMW-41, MW-27, and GMW-31. The primary sample for well GMW-12 was nondetect for TBA, but the field duplicate sample was 4.4 μg/L during this semiannual event. Overall, the TBA concentrations in the north-central area are generally stable with previous sampling events.

Near the truck rack area, as isolated detection of TBA was reported in well GMW-14. No detections were reported in any wells in the intermediate 24-inch block valve area or south-central area. In the south-central area, decreases in TBA concentrations were reported in wells GMW-27 and PZ-10 during this event (nondetect) as compared to the October 2009 event (830 and 30 μg/L, respectively). Similarly, a decrease in TBA concentration (to nondetect) was reported in well PZ-10.

In the northwest portion of the site, detections of TBA were reported in wells GW-3, GW-13, and MW-27. TBA was not detected in any of the eastern, western, or southern offsite wells. TBA also was not detected in any of the Exposition aquifer wells during the semiannual monitoring event.

### 4.3.6 Other Fuel Oxygenates

Pursuant to the RWQCB's request in March 2009, analysis for other fuel oxygenates including ethyl tertiary butyl ether (ETBE), di-isopropyl ether (DIPE), TBA, and tertiary amyl methyl ether (TAME) using EPA Method 8260B was added to the MRP for this and future sampling events (RWQCB, 2009a and 2009b). ETBE was not detected in any of the samples collected during this sampling event. DIPE was generally detected in wells located in the intermediate 24-inch block valve area, the south-central area, southern offsite area, and West Side Barrier region. The southern offsite detection of DIPE was limited to well GWM-O-14 (180 μg/L). Low-level detections of TAME were reported in four wells (GMW-14, GMW-19, GMW-O-15, and TF-16) during the April/May 2010 sampling event.

## 4.4 Quality Assurance/Quality Control

Alpha and Calscience did not report any significant quality assurance/quality control issues with the analytical work performed as a part of the January/March sentry event, April monthly event, and April/May semiannual event. A total of 15 duplicate groundwater samples, 17 trip blanks, and 13 equipment blanks were submitted to the laboratories between January and May 2010. All trip blank and equipment blank samples were reported as nondetect for all analytes. Analytical results for duplicate groundwater samples and trip/equipment blanks are summarized in Tables 12 and 13, respectively.

## 4.5 Water Disposal

Purged groundwater from this monitoring event was treated at the onsite remediation systems. Purged groundwater extracted by Blaine Tech on behalf of SFPP was treated in the SFPP system located in the southern part of the site and discharged under National Pollutant Discharge Elimination System (NPDES) Permit No. CA0063509. Purged groundwater extracted by Blaine Tech on behalf of DESC was treated in the DESC system located in the northern part of the site and discharged under NPDES Permit No. CAG834001.

## 4.6 Health and Safety

Field activities were conducted in accordance with the site-specific health and safety plan. The health and safety plan included protocol for safe work practices during the field portion of the project. Personnel working at the site were required to read, sign, and adhere to the health and safety plan. The health and safety plan was in effect throughout the monitoring events.

# 5. Summary

Groundwater monitoring of sentry wells and other selected wells was conducted in January and March 2010. Semiannual monitoring of these and other wells at the site and in the site vicinity was conducted during April and May 2010. In general, free product and groundwater quality conditions interpreted from these monitoring events are similar to those interpreted for the October 2009 semiannual monitoring event.

## 5.1 Groundwater Flow Conditions

Groundwater elevations increased by approximately 0.4 foot at the site since the October 2009 semiannual monitoring event. During April/May 2010, the overall sitewide horizontal hydraulic gradient in the upper groundwater zone ranged from 0.001 ft/ft to 0.002 ft/ft to the northwest and north-northeast, respectively. The horizontal hydraulic gradient in the Exposition aquifer was 0.001 ft/ft to the southeast, similar to the general historical flow direction.

## 5.2 Distribution of Free Product

The two free product plumes in the north-central and eastern areas are interpreted based on the data collected in April 2010; the plumes are located in the same general areas as interpreted for previous monitoring events. However, free product plumes were not contoured near wells TF-23, GMW-35, and GMW-7 where free product has been reported during past sampling events. An isolated occurrence of free product was reported southeast of the north-central area in well GMW-53 (0.01-foot thickness) where free product has not been reported during past events. Free product was not reported in the south-central area during this semiannual event; however, free product plumes are interpreted to be present based on historical data for this area. Free product was observed north of the truck rack area in well MW-15, and near the southeastern 24-inch block valve area in well GMW-36.

## 5.3 Dissolved-Phase Constituents

### 5.3.1 Total Petroleum Hydrocarbons

The lateral extent of the TPH plume in the north-central area remains similar to the interpreted plume for October 2009. The lateral extent of TPH in the southern offsite area has been reduced slightly relative to October 2009, based on TPH concentrations not observed in offsite well GMW-O-2. The southern offsite wells with TPH detections include wells GMW-O-10 and GMW-O-14. The lateral extent of TPH in the south-central plume area is also slightly reduced to the north based on a nondetect TPH concentration reported in well MW-12. TPH was nondetect in western offsite well WCW-8, which had a TPH concentration of 200 μg/L during the October 2009 sampling event. Overall, the lateral extent of the TPH plume in the southeastern area is similar to the interpreted plume for past events. TPH was not detected in any of the Exposition aquifer wells.

### 5.3.2 Benzene

Benzene was not detected in offsite wells west of the site or in any of the Exposition aquifer wells, with the exception of a groundwater sample collected by Blaine Tech on behalf of DESC in well EXP-3 (0.31J μg/L). None of the analytes were detected in the split groundwater sample from well EXP-3 collected by Blaine Tech on behalf of SFPP. The lateral extents of dissolved benzene plumes across the site were similar to the October 2009 interpretation. The lateral extent of the western portion of the plume was extended slightly based on a low-level detection at well PZ-3. Benzene also was detected in various wells near the truck rack area, north-central area, eastern area, and southeastern area.

### 5.3.3 1,2-Dichloroethane

The extent of 1,2-DCA was interpreted as two separate plumes in the west and south-central portions of the site. 1,2-DCA remained nondetect in all of the Exposition aquifer wells and in offsite wells west of the site, except in wells WCW-3 and WCW-7 where 1,2-DCA was detected at concentrations below the conservative risk-based cleanup goal (70 μg/L). The general extent of dissolved 1,2-DCA beneath the western part of the site was similar to the extent interpreted for the October 2009 monitoring event. Detected concentrations of 1,2-DCA were below the conservative risk-based cleanup goal for 1,2-DCA, except in well GMW-O-14.

### 5.3.4 Methyl Tertiary Butyl Ether

Overall, the distribution of dissolved MTBE was similar to that interpreted for the previous semiannual monitoring event. MTBE remained nondetect in offsite monitoring wells west of the site, except in well WCW-7 where the concentration remains low (1.2 μg/L). With the exception of MTBE in wells MW-SF-1 in the south-central area, MW-SF-4 in the intermediate block valve area, and PZ-5 and GMW-O-15 in the southeastern area, detected concentrations of MTBE were below the conservative risk-based cleanup goal for MTBE (40 μg/L). MTBE was not detected in any of the Exposition aquifer wells, with one exception. The groundwater sample collected by Blaine Tech on behalf of DESC from well EXP-1 contained trace levels of MTBE (0.44J μg/L). However, MTBE was not detected in the split sample from EXP-1 collected by Blaine Tech on behalf of SFPP.

### 5.3.5 Tertiary Butyl Alcohol

Pursuant to the RWQCB's request in March 2009, fuel oxygenates including TBA were analyzed during the April/May 2010 semiannual event. The lateral extent of higher-concentration TBA (1,500 μg/L or greater) is limited to the north-central and southeastern 24-inch block valve areas. Other isolated and low-level detections of TBA (less than 50 μg/L) were reported north of the south-central area, north of the truck rack area, and near the northwestern portion of the site. TBA was not detected in the south-central area or any of the eastern, western, or southern offsite wells. TBA also was not detected in any of the Exposition aquifer wells during the semiannual monitoring event.

### 5.3.6 Other Fuel Oxygenates

Other fuel oxygenates including ETBE, DIPE, and TAME were analyzed during the April/May 2010 semiannual event. DIPE was generally detected in wells located in the intermediate 24-inch block valve area, the south-central area, southern offsite area, and West Side Barrier region. Low-level detections of TAME were reported in four wells and

ETBE was not detected during the April/May 2010 sampling event. Fuel oxygenates will continue to be monitored and results will be further assessed to determine if additional actions are necessary.

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